ABSTRACT OF THE Ph.D. THESIS ENTITLED

"STUDY OF LIQUID-LIQUID EXTRACTION OF PLATINUM GROUP METALS FROM VARIOUS MEDIA."

Submitted to

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IN

CHEMISTRY

BY

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“STUDY OF LIQUID-LIQUID EXTRACTION OF PLATINUM GROUP METALS FROM VARIOUS MEDIA."

The recovery of platinum group metals (PGMs) such as Ru, Rh, Pd, and Pt from different matrices is always a challenging task for a chemist. The great aesthetic value and technological importance of these metals has created a never ending demand. In the past few decades precious metals have found new application outside the jewelry and decorative industries due to its excellent physical and chemical properties. These metals are widely used in automotive catalytic convertors, electronics, glass industries, as catalyst in chemical and petroleum refining industries, and in medical sciences etc. In biology and medicine an increasing use of platinum metal group compounds is anticipated, because of their potential anti-tumor activity. The clinical applications of gold and the side-effects in the treatment of rheumatic arthritis are well-known. The natural abundance of PGMs in earth crust is very less and the increasing demands of these metals in the industrial processes next to their extremely scarcity due to their natural abundance and the complexity of the process used for its extraction and refining, therefore, it is of paramount importance in the development of separation methods to recover these metals to meet the future demand. Different separation techniques have been developed to separate and recover platinum group metals like solvent extraction, ion exchange, sorption techniques, liquid membranes, impregnated resins and Gravimetric methods.

Solvent extraction has become an effective and widely used separation technique than others, because of speed, ease, selectivity, cost effective and it is useful for the isolation and purification of compounds, either inorganic materials or organic substances at macro or microgram concentrations. The spectrophotometric method is preferred for determination of metals followed by the solvent extraction separation, in comparison to other determination techniques; as it is quite economical and widely used technique for the detection of metal ions.

Over past few years, in a considerable number of studies, several extractants have been used for the extraction of trace amount of PGMs. Most of these show longer equilibration time and difficult to synthesize. Sulphur containing Schiff bases showed promising effects in the field of analytical chemistry for the separation and estimation of these metals. As a soft acid, PGMs has great affinity for soft base ligands containing Sulphur-Nitrogen as donor atoms.

The present work includes the synthesis of novel extractant and their applications for the selective and rapid extraction of platinum group metals from, binary mixtures, synthetic mixtures, alloys and Ayurvedic samples.

In the present work, we have prepared extractant and characterized by Fourier-Transform infra-red spectroscopy (FT-IR), nuclear magnetic resonance (NMR), UV-visible spectrometry, and Mass spectrophotometry techniques. Their applications for the selective and rapid extraction of platinum group metals from, binary mixtures, synthetic mixtures, alloys and Ayurvedic samples are to be presented in the thesis.

PRESENT WORK

The work undertaken entitled **"STUDY OF LIQUID-LIQUID EXTRACTION OF PLATINUM GROUP METALS FROM VARIOUS MEDIA.",** is presented in seven chapters. A chapter wise summary is given below. :-

CHAPTER I:

Chapter-I deals with the introduction of solvent extraction and it's theories in brief, an account of high molecular weight amine and their significance and some basic principles of spectrophotometry. A brief review of literature on previous studies on solvent extraction of metals and in particular recent work on the extraction of platinum group metals related to the present work has been incorporated. At the end of this topic, the aim of present investigation has been outlined.

CHAPTER II:

This chapter describes the synthesis and characterization of following extractant.

1) N-n-decylaminopyridine

Above extractant characterized by (FT-IR), NMR, MASS and UV.

CHAPTER-III

This chapter describes the application of extractant N-n-decylaminopyridine for the extraction of Rhodium (III) from malonate organic acid media and its spectrophotometric determination by stannous chloride method. This method is successfully applied for the extraction of Rhodium (III) from different synthetic mixtures, binary mixtures, and alloys.

CHAPTER-IV

This chapter describes the application of extractant N-n-decylaminopyridine for the extraction of Palladium (II) from malonate organic acid media and its spectrophotometric determination by pyrimidine-2-thiol. This method is successfully applied for the extraction of Palladium (II) from different synthetic mixtures, binary mixtures, and alloys.

CHAPTER-V

This chapter describes the application of extractant N-n-decylaminopyridine for the extraction of gold (III) from malonate organic acid media and its spectrophotometric determination by stannous chloride. This method is successfully applied for the extraction of gold (III) from different synthetic mixtures, binary mixtures, real samples, Ayurvedic samples and alloys.

CHAPTER-VI

This chapter includes the extraction of Platinum (IV) with N-n-decylaminopyridine succinate organic acid media and its spectrophotometric determination by stannous chloride method. This method is successfully applied for the extraction of Platinum (IV) from different synthetic mixtures, binary mixtures, and alloys.

CHAPTER-VII

This chapter includes the extraction of Ruthenium (III) with N-n-decylaminopyridine from succinate organic acid media and its spectrophotometric determination by pyrimidine-2-thiol. This method is successfully applied for the extraction of Ruthenium(III) from different synthetic mixtures, binary mixtures, and alloys.

Original Work

The synthesized extractant is reported for the first time. This extractant is successfully applied for the selective and rapid extraction of platinum group metals from binary mixtures, synthetic mixtures, alloys and Ayurvedic samples.

The synthesized extractant is characterized by NMR, IR, MASS and UV spectral techniques.

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